Sardar Patel University of Police, Security and Criminal Justice, Jodhpur(Raj)

ENTRANCE TEST 2016

COURSE CODE : 102

MASTER OF TECHNOLOGY IN CYBER SECURITY

Signature and Name of Invigilator	(To be filled by candidate) OMR Sheet No.....
Signature	Roll No (In Figures) .....
Name	Roll No (In Words) ....
Time:1 Hour	Maximum Marks: 50
Number of pages in this Booklet: 16	Number of Question In this Booklet:50

1. **Write your roll number in the space provided on the top of this page.**
2. This paper consists of **Fifty (50) multiple-choice type** of questions.
3. At the commencement of examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as below :
   i) **Tally the number of pages and number of questions in the Booklet with the information printed on the cover page**
   ii) After this verification is over, the OMR Sheet Number should be entered on this Test Booklet Code.
4. Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.

   Example : (A) (B) ● (D)

   where (C) is the correct response.
5. Your responses to the items are to be indicated in the **OMR Sheet.**
6. Rough Work is to be done in the end of this booklet.
7. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Sheet, except for the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means such as change of response by scratching or using white fluid, you will render yourself liable to disqualification
8. You have to return the original OMR Sheet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. You are however, allowed to carry duplicate copy of OMR Sheet on conclusion of examination.
9. **Use only Blue/Black Ball point pen.**
10. **Use of any calculator or log table etc., is prohibited.**
11. **Each question carries one mark. There are no negative marks for incorrect answers.**
12. In case of any discrepancy in the English and Hindi versions, English version will be taken as final.

1. Define an RP-tree by the parent-child adjacency lists as follows:

(i) Root B: J, H, K; (ii) H: P, Q, R;

(iii) Q: S, T; (iv) K: L, M, N.

The preorder vertex sequence of this tree is

(A) B, J, P, Q, S, T, R, H, K, L, M, N.

(B) B, J, P, Q, S, T, R, H, L, M, N, K.

(C) B, J, Q, P, S, T, R, H, L, M, N, K.

(D) B, J, Q, S, T, P, R, H, K, L, M, N.

2. Let $b > 1$. Then $\log_b((n^2)!)$ is:

(A) $\theta(\log_b(2n!))$ (B) $\theta(n \log_b(n))$

(C) $\theta(n^2 \log_b(n))$ (D) $\theta(n \log_b(n^2))$

3. What is the total number of additions and multiplications in the following code?

```
s:=0
for i: = 1 to n
        s: = s + i
        for j:= 1 to i
                s:=s+j*i
        next j
next i
s:=s+10
```

(A) n^2 (B) $n^2 + 2n$

(C) $n(n+1)$ (D) $(n+1)^2$

4. Let G be a complete undirected graph on 6 vertices. If vertices of G are labeled, then the number of distinct cycles of length 4 in G is equal to

(A) 30 (B) 360

(C) 45 (D) 15

5. Which one of the following statements is TRUE about every

(A) If the trace of the matrix is positive and the determinant of the matrix is negative, at least one of its eigenvalues is negative.

(B) If the trace of the matrix is positive, all its eigenvalues are positive.

(C) If the product of the trace and determinant of the matrix is positive, all its eigenvalues are positive.

(D) If the determinant of the matrix is positive, all its eigenvalues are positive.

6. Let a(x, y), b(x, y,) and c(x, y) be three statements with variables x and y chosen from some universe. Consider the following statement:
$(\exists x)(\forall y)[(a(x, y) \wedge b(x, y)) \wedge \neg c(x, y)]$

Which one of the following is its equivalent?

(A) $(\forall x)(\exists y)[(a(x, y) \vee b(x, y)) \rightarrow c(x, y)]$

(B) $(\exists x)(\forall y)[(a(x, y) \vee b(x, y)) \wedge \neg c(x, y)]$

(C) $\neg (\forall x)(\exists y)[(a(x, y) \wedge b(x, y)) \rightarrow c(x, y)]$

(D) $\neg (\forall x)(\exists y)[(a(x, y) \vee b(x, y)) \rightarrow c(x, y)]$

7. Suppose that the eigenvalues of matrix A are 1, 2, 4. The determinant of $(A^{-1})^T$ is:

(A) 1/8 (B) 1

(C) 1/4 (D) 2

8. An unbalanced dice (with 6 faces, numbered from 1 to 6) is thrown. The probability that the face value is odd is 90% of the probability that the face value is even. The probability of getting any even numbered face is the same. If the probability that the face is even given that it is greater than 3 is 0.75, which one of the following options is closest to the probability that the face value exceeds 3?

(A) 0.453 (B) 0.468

(C) 0.485 (D) 0.492

9. A test has 5 multiple-choice questions. Each question has 4 answer options (A, B, C, D). What is the probability that a student will choose "B" for at least four questions if she leaves no questions blank?

(A) 1/16 (B) 1/32

(C) 1/64 (D) 1/128

10. Aishwarya studies either computer science or mathematics everyday. If she studies computer science on a day, then the probability that she studies mathematics the next day is 0.6. If she studies mathematics on a day, then the probability that she studies computer science the next day is 0.4. Given that Aishwarya studies computer science on Monday, what is the probability that she studies computer science on Wednesday?

(A) 0.36 (B) 0.24

(C) 0.40 (D) 0.45

11. The bisection method is applied to compute a zero of the function $f(x) = x^4 - x^3 - x^2 - 4$ in the interval [1, 9]. The method converges to a solution after _____ iterations.

(A) 1 (B) 5

(C) 7 (D) 3

12. Two alternative packages A and B are available for processing a database having 10k records. Package A requires $0.0001n^2$ time units and package B requires 10 n log 10n time units to process n records. What is the smallest value of k for which package B will be preferred over A?

(A) 12 (B) 5

(C) 10 (D) 6

13. Which of the following is FALSE about B/B+ tree

(A) B/B+ trees grow upward while Binary Search Trees grow downward.

(B) Time complexity of search operation in B/B+tree is better than Red Black Trees in general

(C) Number of child pointers in a B/B+ tree node is always equals to number of keys in it plus one

(D) A B/B+ tree is defined by a term minimum degree. And minimum degree depends on hard disk block size, key and address sizes.

14. The problem 3-SAT and 2-SAT are

(A) Both in P

(B) Undecidable and NP complete respectively

(C) NP complete and in P respectively

(D) Both NP complete

15. An 8 KB direct-mapped write-back cache is organized as multiple blocks, each of size 32-bytes. The processor generates 32-bit addresses. The cache controller maintains the tag information for each cache block comprising of the following. 1 Valid bit 1 Modified bit As many bits as the minimum needed to identify the memory block mapped in the cache. What is the total size of memory needed at the cache controller to store meta-data (tags) for the cache?

(A) 4864 bits

(B) 6144 bits

(C) 6656 bits

(D) 5376 bits

16. A computer system has an L1 cache, an L2 cache, and a main memory unit connected. The block size in L1 cache is 4 words. The block size in L2 cache is 16 words. The memory access times are 2 nanoseconds, 20 nanoseconds and 200 nanoseconds for LI cache, L2 cache and main memory unit respectively. When there is a miss in L1 cache and a hit in L2 cache, a block is transferred from L2 cache to L1 cache. What is the time taken for this transfer?

(A) 88 nanoseconds

(B) 22 nanoseconds

(C) 44 nanoseconds

(D) 2 nanoseconds

17. In an instruction execution pipeline, the earliest that the data TLB (Translation Lookaside Buffer) can be accessed is

(A) Before effective address calculation has started

(B) During effective address calculation

(C) After effective address calculation has completed

(D) After data cache lookup has completed

18. Consider a machine with a byte addressable main memory of 2^{16} bytes. Assume that a direct mapped data cache consisting of 32 lines of 64 bytes each is used in the system. A 50 × 50 two-dimensional array of bytes is stored in the main memory starting from memory location 1100H. Assume that the data cache is initially empty. The complete array is accessed twice. Assume that the contents of the data cache do not change in between the two accesses. How many data cache misses will occur in total?

(A) 50 (B) 40

(C) 56 (D) 59

19. Consider the following recurrence:

$T(n)=2T(\lfloor\sqrt{n}\rfloor)+1, T(1)=1$

Which one of the following is true?

(A) $T(n) = \Theta$ (loglogn) (B) $T(n) = \Theta$ (logn)

(C) $T(n) = \Theta$(sqrt(n)) (D) $T(n) = \Theta$ (n)

20. If P, Q, R are subsets of the universal set U . then

$(P \cap Q \cap R) \cup (P^C \cap Q \cap R) \cup Q^C \cup R^C$ is

(A) $Q^C \cup R^C$

(B) $P \cup Q^C \cup R^C$

(C) $P^C \cup Q^C \cup R^C$

(D) U

21. How many different non-isomorphic Abelian groups of order 4 are there?

(A) 2 (B) 3

(C) 4 (D) 5

22. Assume that source S and destination D are connected through two intermediate routers labeled R. Determine how many times each packet has to visit the network layer and the data link layer

during a transmission from S to D.

(A) Network layer - 4 times and Data link layer - 4 times

(B) Network layer - 4 times and Data link layer - 3 times

(C) Network layer - 2 times and Data link layer - 4 times

(D) Network layer - 4 times and Data link layer - 6 times

23. Every host in an IPv4 network has a 1-second resolution real-time clock with battery backup. Each host needs to generate up to 1000 unique identifiers per second. Assume that each host has a globally unique IPv4 address. Design a 50-bit globally unique ID for this purpose. After what period (in seconds) will the identifiers generated by a host wrap around?

(A) 128 (B) 64

(C) 256 (D) 512

24. In a packet switching network, packets are routed from source to destination along a single path having two intermediate nodes. If the message size is 24 bytes and each packet contains a header of 3 bytes, then the optimum packet size is:

(A) 4 (B) 6

(C) 7 (D) 9

25. Which of the following assertions is FALSE about the Internet Protocol (IP) ?

(A) It is possible for a computer to have multiple IP addresses

(B) IP packets from the same source to the same destination can take different routes in the network

(C) IP ensures that a packet is discarded if it is unable to reach its destination within a given number of hops

(D) The packet source cannot set the route of an outgoing packets; the route is determined only by the routing tables in the routers on the way

26. To which generation of cellular networks does LTE belongs?

(A) 1G
(B) 2G
(C) 3G
(D) 4G

27. WiMAX corresponds to

(A) Worldwide Interoperable Microwave Access
(B) Web Interoperable Microwave Access
(C) Worldwide Interoperability for Microwave Access
(D) Web Interoperability for Microwave Access

28. Host A (on TCP/IP v4 network A) sends an IP datagram D to host B (also on TCP/IP v4 network B). Assume that no error occurred during the transmission of D, When D reaches B, which of the following IP header field(s) may be different from that of the original datagram D?

I. TTL
II. Fragment Offset
III Checksum

(A) I, II and III
(B) I and II only
(C) II and III only
(D) I and III only

29. A container originally contains 10 litres of pure spirit. From this container 1 litre of spirit is replaced with 1 litre of water. Subsequently. 1 litre of the mixture is again replaced with 1 litre of water and this process is repeated one more time. How much spirit is now left in the container?

(A) 7.58 litres
(B) 7.84 litres
(C) 7 litres
(D) 7.29 litres

30. Which of the following assertions is FALSE about the Internet Protocol (IP) ?

(A) It is possible for a computer to have multiple IP addresses

(B) IP packets from the same source to the same destination can take different routes in the network

(C) IP ensures that a packet is discarded if its is unable to reach its destination within a given number of hops

(D) The packet source cannot set the route of an ongoing packet; the route is determined only by the routine tables in the routers on the way.

31. Suppose we have a O(n) time algorithm that finds median of an unsorted array. Now consider a Quick sort implementation where we first find median using the above algorithm, then use median as pivot. What will be the worst case time complexity of this modified Quicksort

(A) $O(n^2 Logn)$ (B) $O(n^2)$

(C) O(n Logn Logn) (D) O(n Logn)

32. There are n stations in a slotted LAN. Each station attempts to transmit with a probability p in each time slot. What is the probability that ONLY one station transmits in a given time slot?

(A) $(1-p)^{(n-1)}$ (B) $np(1-p)^{(n-1)}$

(C) $p\,(1-p)^{(n-1)}$ (D) $1-(1-p)^{(n-1)}$

33. How many 8-bit characters can be transmitted per second over a 9600 baud serial communication link using asynchronous mode of transmission with one start bit. eight data bits, two stop bits, and one parity bit ?

(A) 776 (B) 800

(C) 876 (D) 1200

34. What is the time complexity of fun()?

```
int fun(int n)
{
    int count = 0;
    for (int i = 0; i < n; i++)
        for(int j = i; j>0 ; j--)
            count = count + 1;
    return count; }
```

(A) O(n) (B) $O(n^2)$

(C) O(nLogn) (D) O(nLogn Logn)

35. Consider a CSMA/CD network that transmits data at a rate of 100 Mbps (108 bits per second) over a 1 km (kilometer) cable with no repeaters. If the minimum frame size required for this network is 1200 bytes, what is the signal speed (km/sec) in the cable?

(A) 20000 (B) 20833

(C) 16000 (D) 16833

36. Mala has a colouring book in which each English letter is drawn two times. She wants to paint each of these 52 prints with one of k colours, such that the colour-pairs used to colour any two letters are different. Both prints of a letter can also be coloured with the same colour. What is the minimum value of k that satisfies this requirement ?

(A) 9 (B) 8

(C) 7 (D) 6

37. The following postfix expression with single digit operands is evaluated using a stack:

8 2 3 ∧ / 2 3 * + 5 1 * -

Note that ∧ is the exponentiation operator. The top two elements of the stack after the first * is evaluated are:

(A) 6, 1 (B) 5, 7

(C) 3, 2 (D) 1, 5

38. Consider a hash table of size seven, with starting index zero, and a hash function (3x + 4)mod7. Assuming the hash table is initially empty, which of the following is the contents of the table when the sequence 1, 3, 8, 10 is inserted into the table using closed hashing? Note that '_' denotes an empty location in the table.

(A) 8, __, __, __, __, __, 10

(B) 1, 8, 10, __, __, __, 3

(C) 1, __, __, __, __, __, 3

(D) 1, 10, 8, __, __, __, 3

39. Given the language L = {ab, aa, baa}. Which of the following strings are in L* ?

(1) abaabaaabaa

(2) aaaabaaaa

(3) baaaaabaaaab

(4) baaaaabaa

(A) 1, 2 and 3

(B) 2, 3 and 4

(C) 1, 2 and 4

(D) 1, 3 and 4

40. Which of the following is true

(A) Every relation in 3NF is also in BCNF

(B) A relation R is in 3NF if every non-prime attribute of R is fully functionally dependent on every key of R

(C) Every relation in BCNF is also in 3NF

(D) No relation can be in both BCNF and 3NF

41. The number of bijictions that can be defined from {a, b, c, d} onto {1, 2, 3, 4} is

(A) 0

(B) 4^4

(C) 4^2

(D) 24

42. If f: R→R is defined by $f(x)=x^3$ 1, then f is

(A) Only a function
(B) One-one but not onto
(C) onto
(D) one-one, onto

43. Let A and B are two finite sets with m and n elements respectively. If the total number of relations from A to B is 64, then possible values of m and n are.

(A) 2 and 4
(B) 2 and 3
(C) 2 and 1
(D) can not be determined

44. Let P(A)=1/3, P(B)=1/4, P(A/B)=1/6, then the probability P(B/A) =

(A) 1/4
(B) 3/4
(C) 1/8
(D) None of these

45. If the letters of the word 'MEANS' are arranged taken all at a time. Find how many do not start with AS.

(A) 5! x 2!
(B) 5!/6
(C) 5!-6
(D) Not more than 5!

46. Let P and q are any two mathematical statements. Then which one of the following is not correct.

(A) $\sim(p \vee q) \equiv \sim P \wedge \sim q$
(B) $\sim(p \Rightarrow q) \equiv P \vee \sim q$
(C) $\sim(p \wedge q) \equiv \sim P \wedge \sim q$
(D) None of these

47. Every non-Zero finite dimensional vector space has

(A) Unique basis
(B) Exactly two bases
(C) Many bases
(D) Unique but finite basis

48. Let A and B are any two $n \times n$ $(n > 0)$ matrices than

(A) A+B is singular if A an B are singular

(B) A+B is not singular if A an B are singular

(C) A+B is not necessarily singular if A an B are singular

(D) Question is not complete

49. Let $\lambda_1, \lambda_2, \ldots\ldots\ldots\ldots\ldots\ldots\lambda_n$ are n-non-zero distinct eigenvalues of a matrix A. Then the rank of A is

(A) 0

(B) $< n$

(C) $> n$

(D) None of these

50. Which one of the following is correct:

(A) Every complete graph is regular

(B) Every regular graph is complete

(C) Every complete graph is simple

(D) None of these